# Uncertainty in Pricing Decisions in Competitive Bidding for Service Contracts

ICED 11 København

## Research context:

- ***Servitisation***: Transformation of market structures to the stage where manufacturing companies have to ***compete through*** offering ***services*** as opposed to physical products

- ***Examples***: delivery of 'power-by-the-hour' [Baines et al. 2007], supply of the number of flying hours for an aircraft [BAE 2010], support of a submarine through life [Rolls-Royce 2011]

- The delivery of a service is usually embedded in a ***service contract***. These are often allocated through the process of ***competitive bidding*** where the competing suppliers communicate their service specifications and price bid to the customer who then evaluates the bids.

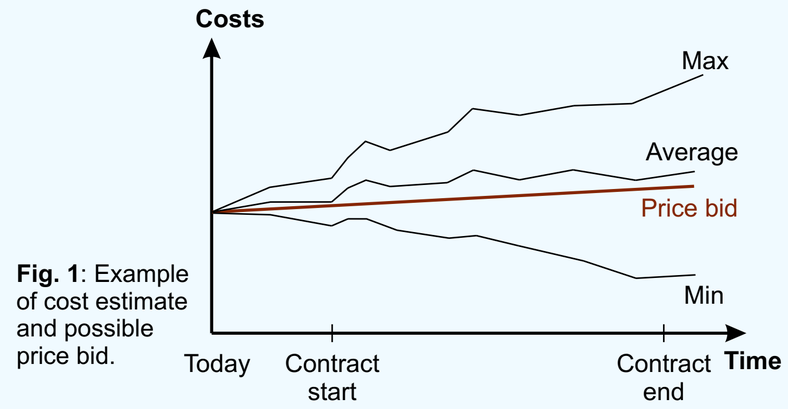


**Fig. 1**: Example of cost estimate and possible price bid.

## Methodology:

The ***aim*** of this research is to support this decision process by defining a ***process*** from the identification of influencing uncertainties on the pricing decision to their modelling and inclusion in a decision matrix which depicts the trade-off between the ***probability of winning*** and the ***probability of making a profit***. This means in particular;

| What? | How? |
|---|---|
| 1) To define a holistic approach to characterise the uncertainty inherent in a situation as a basis for its modelling and management. | Literature study of uncertainty research. |
| 2) To describe the uncertainty connected to a pricing decision. | Empirical studies with practitioners Results see [Kreye et al. 2012] |
| 3) To define a framework of the uncertainties influencing a pricing decision. | Induction from objectives 1 and 2. |
| 4) To create a decision matrix based on the uncertainty characteristics and the identified modelling techniques. | Case study of contract bidding example. |

## Problem statement:

Within the ***range of estimated costs*** for fulfilling the service contract, the decision maker has to select ***one point*** as a price bid to communicate to the customer (Fig. 1).

To do this, the decision maker has to;
1) understand the uncertainty in the cost estimate,
2) understand other uncertainties that influence the bidding success and the fulfilment of the service contract.

## Research results:

***1)*** Holistic classification for ***uncertainty characteristics*** in ***5 layers*** (Fig. 2), ***application*** to existing ***modelling techniques*** such as frequentist probability theory, subjective probability theory, imprecise probability theory, Information gap theory, Interval analysis, Possibility theory, fuzzy set theory and Evidence theory

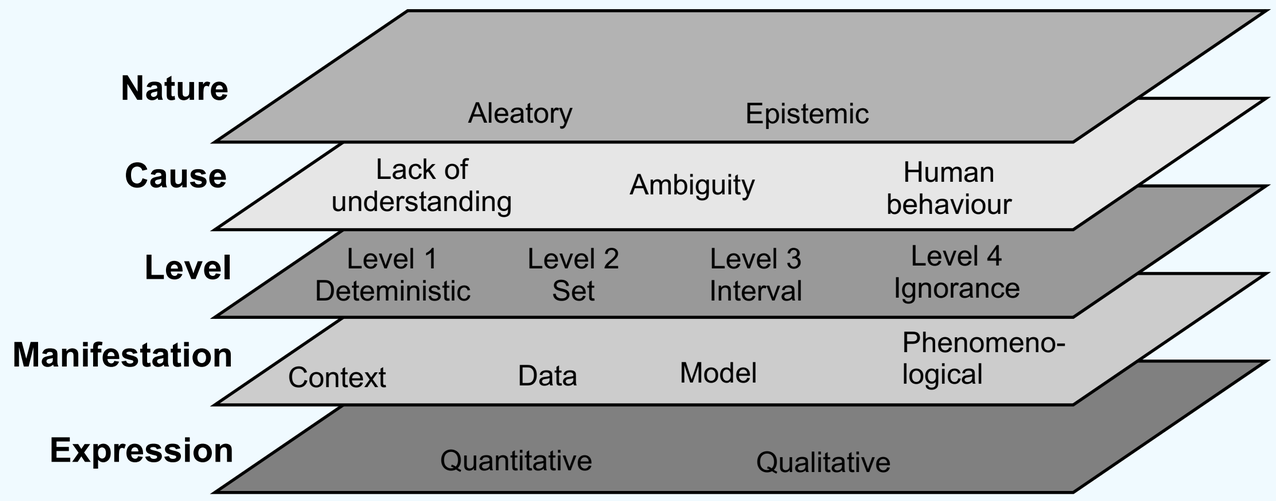


Fig. 2: 5-layer uncertainty classification

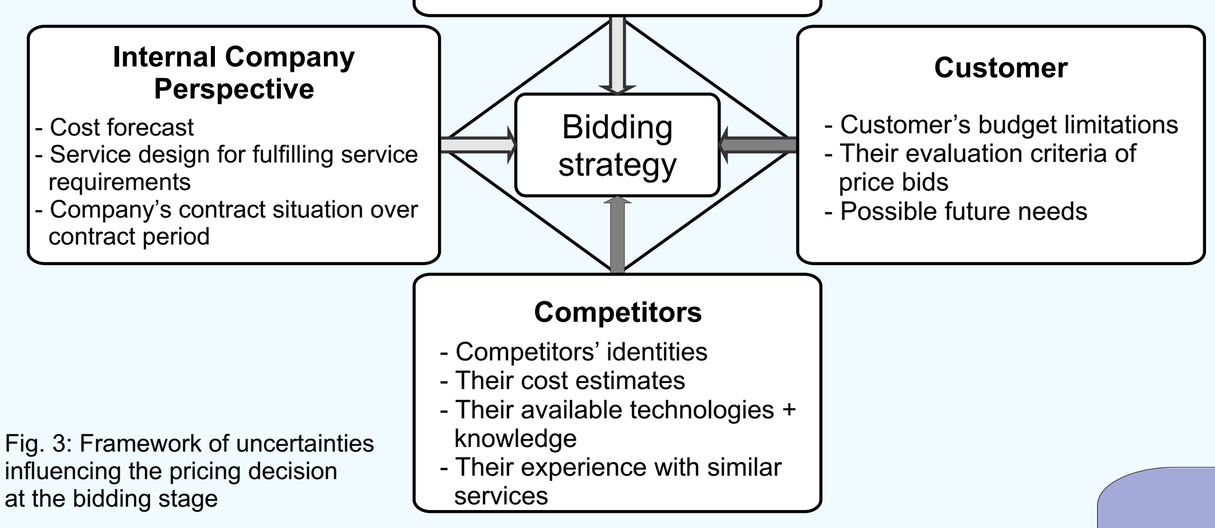


Fig. 3: Framework of uncertainties influencing the pricing decision at the bidding stage

***2)*** ***Framework*** which depicts the uncertainties influencing the pricing decisions (Fig. 3) and ***characterisation of this uncertainty*** with the ***5-layer*** classification

***3)*** ***Identification*** of suitable ***modelling techniques*** through comparison of characteristics in 1 and 2: subjective probability and interval analysis

## Further work:

Step 4: Creation of a decision matrix for a case study (Fig. 4):
utilising the identified uncertainty modelling techniques to model the uncertainty arising from the ***customer*** and the ***competitors*** and include them in the decision matrix as the ***probability of winning*** and the ***probability of making profit***

| | Price bids | | | | |
|---|---|---|---|---|---|
| Probability of winning the contract | | | | | |
| Probability of making profit | | | | | |

Fig. 4: Example of a decision matrix depicting the probability of winning the contract and the probability of making a profit.

## References:


Baines et al. 2007: Baines, T.S., Lightfoot, H.W., Evans, S., Neely, A., Greenough, R., Peppard, J., Roy, R., Shehab, E., Braganza, A., Tiwari, A., Alcock, J.R., Angus, J.P., Bastl, M., Cousens, A., Irving, P., Johnson, M., Kingston, J., Lockett, H., Martinez, V. & Michele, P. (2007): State-of-the-art in product-service systems. In: Proceedings of the Institution of Mechanical Engineers - Part B - Journal for Engineering Manufacture, 221(2007), pp. 1543-1552.

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